Mechelecty

VOL. 12 MAY 1953 NO. 6

SCHOOL OF ENGINEERING
THE GEORGE WASHINGTON UNIVERSITY

Only STEEL can do so many jobs so well

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Photo—Standard Oil Co. (N. J.)

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3-1092

One day of feeling better doesn't mean you're cured

EVER HAVE FLU, feel better, and go out too soon—only to have a relapse worse than the first attack?

For years the world has been sick. "Something-for-nothing," Welfare State, Socialism, "more-pay-for-less-work"—the disease has different names at different times and places, but it's the same trouble—loss of energy, ambition, faith-in-yourself.

Now much of the world and especially this part of it is feeling better; we think we'll live—as this is written it looks as though more housing, lower prices, lower taxes, and most important of all, less war, are in prospect. BUT—

Don't let's take it too easy too soon. The fever of inflation and debt have wasted the nation's strength and substance which have to be built back. If we continue our tried and true American medicine of hard work, and add the convalescent tonic of thrift, we'll really recover. But as any doctor knows, this first surge of "feeling better" is the dangerous stage:

A relapse could kill us.

to the

ELECTRICAL ENGINEER

or

PHYSICIST

with an interest in

RADAR

or

ELECTRONICS

Hughes Research and Development Laboratories, one of the nation's leading electronics organizations, are now creating a number of new openings in an important phase of their operation.

Here is what one of these positions offers you:

THE COMPANY

Hughes Research and Development Laboratories, located in Southern California, are presently engaged in the development and production of advanced radar systems, electronic computers and guided missiles.

THE NEW OPENINGS

The positions are for men who will serve as technical advisors to government agencies and companies purchasing Hughes equipment—also as technical consultants with engineers of other companies working on associated equipment. Your specific job would be essentially to help insure successful operation of Hughes equipment in the field.

THE TRAINING

On joining our organization, you will work in the Laboratories for several months to become thoroughly familiar with the equipment which you will later help users to understand and properly employ. If you have already had radar or electronics experience, you will find this knowledge helpful in your new work with us.

WHERE YOU WORK

After your period of training—at full pay—you may (1) remain with the Laboratories in Southern California in an instructive or administrative capacity, (2) become the Hughes representative at a company where our equipment is being installed, or (3) be the Hughes representative at a military base in this country—or overseas (single men only). Compensation is made for traveling and moving household effects, and married men keep their families with them at all times.

YOUR FUTURE

In one of these positions you will gain all-around experience that will increase your value to our organization as it further expands in the field of electronics. The next few years are certain to see large-scale commercial employment of electronic systems. Your training in and familiarity with the most advanced electronic techniques now will qualify you for even more important future positions.

How to apply:

HUGHES

RESEARCH AND DEVELOPMENT LABORATORIES

Scientific and Engineering Staff
Culver City, Los Angeles County, California

See your Placement Office for appointment with members of our Engineering Staff who will visit your campus. Or address your resumé to the Laboratories.

Mechelectiv

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ON OUR COVER . . .

Engineering students going to class in Corcoran Hall, the home of the School of Engineering at The George Washington University. This is a scene that will be unfamiliar to undergraduate students in the near future. Many engineering and science graduates fondly recall their undergraduate lectures and labs in "Corcoran." In the not too distant future the memories and recollections will be of "Tompkins." Tompkins Hall is the future home of the School of Engineering. It will be located on 23rd street between G and H Streets. Construction is expected to start this spring.

FRONTISPIECE . . .

The world's largest turbine being assembled at General Electric. The size of the turbine is graphically illustrated by the size of the men in the picture.

—Cut courtesy of General Electric

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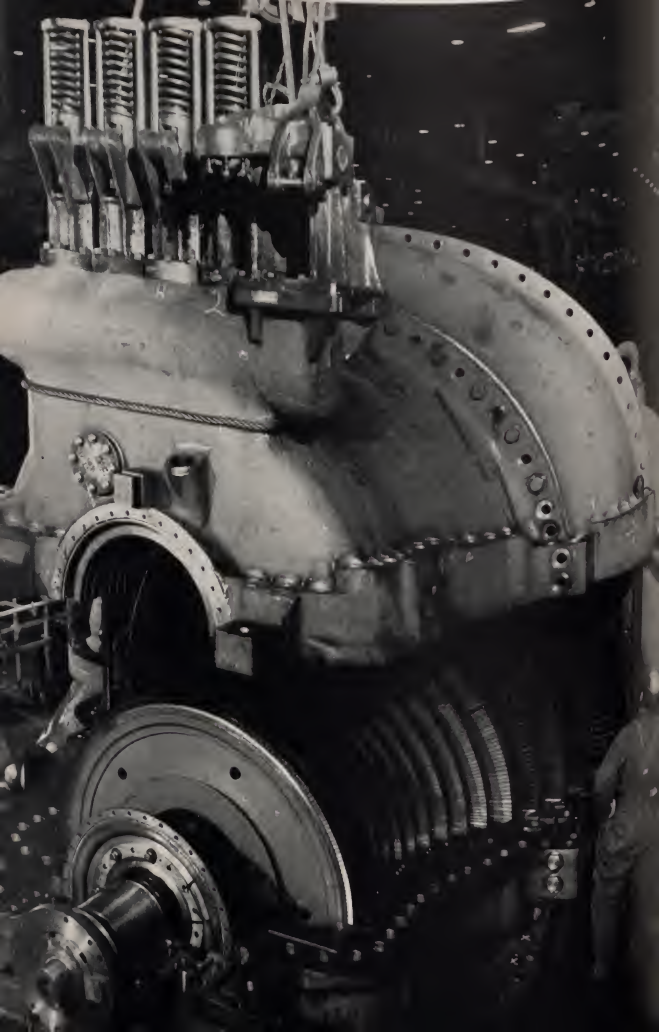


Engineers?

The young man graduating from college with an engineering degree is in greater demand today than ever before. He has been interviewed by representatives of many engineering and business concerns and in all probability has been offered several jobs at very attractive salaries, and promised excellent opportunities for advancement. Does this young man realize that he is not yet an Engineer? It is true he has an academic degree in some phase of Engineering; but, starting now and continuing several years into the future he will serve his apprenticeship in the Engineering profession.

This young man should not think that his starting salary is commensurate with his ability. He should realize that in all probability he is being overpaid and that this high starting wage is due to his potentialities and the law of supply and demand. Today the demand for technically educated men greatly exceeds the supply and there is a sellers' market, the commodity of which is a technically trained college graduate. The young graduate must realize that even though this is the end of his college education, exempting graduate work, he must strive to broaden his knowledge and keep up with developments in his field or become an obsolete tool.

This young man should realize that he is entering a world of great competition. He should commence work in the position he accepts with the knowledge that he is competing for advancement with other men who have the same academic training he does and men who have no college degree but a thorough understanding of engineering principles. He must realize that this competition will increase in the future as the supply of engineering graduates approaches the demand. He should also realize that time, months, weeks, days, will be one of his competitors.

Will this young man be able to meet the challenges of personal competition and time competition in the form of production deadlines and most important of all will he be able to do his job in the most economic manner? If the answer to these questions is NO, he must resign himself to a routine and subordinate position. If the answer is YES then he will be an Engineer.

Plastics Progress

by Warren L. Chestnutt
Undergraduate in Civil Engineering

In an attempt to present a parade of plastics progress, the writer will endeavor to provide the reader with an insight concerning a material which is more and more invading his everyday life, a material which will play a seemingly unbelievable part in his future. No matter what your interests are or what your job is, it is imperative that you become aware of plastics and the revolutionary contributions they are making in all fields of industry.

In reaching their present position in the industrial economy of the country, the plastics people had to overcome an anti-plastics attitude on the part of the public—an attitude developed by inferior products on the market at the end of the last war.

The period immediately following the war was characterized by an intense effort to transfer the expanded resources of the industry from service requirements to new industrial and public uses. Not only was there a need to find new markets for the greatly increased output of plastic materials, but molders and fabricators, of necessity, had to acquire orders to keep their plants at maximum output. In many ways the markets were most propitious; the public had lacked, for most of the war period, those commodities of everyday life which were sacrificed for war production. It was a sellers' market par excellence. The call for finished products such as radios, tableware, clothing, et cetera, was, for a while, apparently insatiable, and was equalled only by the demand for practically all types of industrial components and household equipment, many of which were based on plastic moldings.

During the years 1946 and 1947 there was a rush to "climb on the band wagon," and in 1946 numerous new companies ostensibly linked with plastics were registered. Many of these were sound enough, but many others in that year and in succeeding years were the get-rich-quick type. The rash of consumer products, which spread over the hungry market and which were often of the poorest quality and the worst design, did grave damage to the plastics industry. Irresponsible, misinformed and ill-considered descriptions and prophecies in the daily press and elsewhere did nothing to counter the growing anti-plastics feeling. However, with the retreat of the selling market most of the less desirable elements have left the industry, and the products of today are engineered to do their jobs and do them well.

In obtaining their present day position in industry, in the short period of fifty years, plastics have come a long way, with each year's progress seemingly unbelievable in comparison to the previous year's work. We shall examine briefly the history of that progress, with a limited explanation of the processes involved. We shall then consider some of the various products now in existence which lack full-scale production, as well as a few of the "possibilities" which could become reality tomorrow.

THE DEVELOPMENT OF PLASTICS

Plastics as we know them today are vastly different from their forerunners. A few historians have placed the beginning of plastics as far back as ancient Egypt, but the oldest plastics, as we recognize the term today, were cellulose nitrate materials identified as celluloid, made by a commercial process patented in England by Alexander Parkes in 1865. The discovery of cellulose nitrate itself was made by Schonbein in 1845, but the essential basis of the plastics material is the use of camphor as a plasticizer, which was discovered by Parkes in 1865. From this material which he produced evolved a product eventually applied in the production of fibers, transparent films, and coating materials. Celluloid, though the grandfather of all plastics, still maintains its place in current history, nearly a century after its first introduction.

The tough cellulose nitrate film offered possibilities in the growing photographic industry, and in this and the synthetic fiber industry the less inflammable cellulose acetate was soon used with even greater success.

The real plastics industrial development dates from 1907, when the first of H. L. Baekeland's patents in the production of phenol-formaldehyde resinous products was filed in the United States. Baekeland, a Belgian chemist who had settled in America as a young man, showed that these resinous products of organic reactions, heretofore re-

jected as of no interest to industry, could be converted to definite use.

In the years following World War I the development quickened in pace. The long chain products based on chemical synthesis united with the pioneers based on cellulose and emerged under the much criticized designation of plastics. From the middle twenties this new word appeared more frequently in the world-wide technical and patent literature, and it gathered such importance during World War II that it has now become a household word—possibly too much so—throughout the civilized world.

For broad differentiation, the materials were subdivided according to their behavior under the application of heat and pressure. Those, such as the pioneer cellulose plastics, which suffer no chemical change during the process of heating, but which can be softened and resoftened by the application of moderate heat, were designated thermoplastics. Those which by the heat treatment were so transformed as to become infusable, their constituent changes cross-linked, were classified as thermosetting. In those early days the opinion was freely expressed that the new thermosetting materials would displace the pioneer thermoplastics. After two further decades of development, this has been proved inaccurate, and in spite of many newcomers in both classes, the members of the plastics family have been mutually reinforcing rather than mutually eliminating.

THERMOPLASTICS

The outstanding disability of celluloid, namely its inflammability, was overcome by the production of cellulose-acetate, better known as acetate-rayon. In the production of films, sheets, rods, and tubes, this new product followed many of the applications of its elder brother, celluloid; however, it was unsuited for hot compression molding. The situation was saved by the timely development of the injection molding technique by the German, Arthur Eichengrun. The toughness of thermoplastics and the economic speed and versatility of the injection process gave these materials the lift which they needed to meet the competition of the thermosetting materials, which in the meantime had absorbed the big business in plastics molding. Following in succession came a long line of thermoplastics, differing in degrees of such desired physical properties as a clarity superior in some cases to glass, remarkable toughness, flexibility equal to rubber but lacking its elasticity, water and abrasion resistance of a high order, unusually low density, and remarkable adhesive characteristics.

The most spectacular child of this family, nylon, developed originally as America's answer to the Japanese natural silk monopoly, is associated with the finest stockings and garments in every part of the world. However, this was only a forerunner of many hundreds of applications of nylon in precision mechanism parts.

THERMOSETTING PLASTICS

All of the early molding compositions were thermoplastic. They required heat and pressure to mold them into shape, followed by cooling on the mold under pressure before ejection. When cooled they were in positive molds. In the early twenties when the broadcasting of radio programs was started there was a growing demand for insulator components and fittings for the new radios. To produce them the plastics molders turned to the use of phenolic molding materials, since these materials gave molded components with a better finish and closer dimentional tolerances, at a higher rate of production than could be obtained with the older compositions.

The early phenol-formaldehyde molding materials were made from one-stage resins. In this one-stage, the phenol, the catalysts (ammonia, or caustic soda), and formaldehyde are all added together in the reaction vessel and then heated under carefully controlled conditions, to give a clear amber colored resin which will clear to a hard infusible product on further heating. These early one-stage molding materials required large pressures and a relatively long curing time, ten minutes for a section one eighth of an inch thick. These difficulties were partially overcome through the discovery of the low pressure thermoplastic materials which by suitable treatment give products as nearly insoluble and infusable as to be ranked with the thermosetting materials. These materials when properly reinforced have as well as good moisture resistance, and good electrical properties, impact and tensile strength. An appreciable elongation at the breaking point of some of these materials implies that moldings can be used for stress constructional parts.

With the advancement of injection molding of thermoplastic materials, molders have turned to making uncritical moldings by this method. But for moldings, particularly large ones, which are required to maintain rigidity and close dimentional tolerances at somewhat elevated temperatures, thermosetting materials are the first choice.

REINFORCED PLASTICS

During 1952, while practically all sections of the plastics industry experienced market and production expansion, one group—the reinforced plastics division—enjoyed a production increase of approximately 40 per cent, according to the Society of the Plastics Industry, Inc. In spite of this, reinforced plastics is still small business, not

(Please turn to page 20)

Stronger Engineering Graduates

by Gilbert E. Doan
Research Department, Koppers Co.[1]

It is well recognized that after the four-year round of courses with specialists at college whatever life philosophy the student may have brought from his home has lost its unity. The resulting disunity of thinking leads to disunity and confusion of spirit. This confusion results in weak and uncertain graduates where strong and adaptable leaders are needed. His ideals and convictions *should* be shaken basically by the specialists. But before he leaves college some aid should be given him to re-form at least a tentative life philosophy based on reason and justice. Most men should leave our colleges with a clear and worthy view of life.

The German professors were the world's best specialists, but they turned a deaf ear to the student's professional, civic, social, and ethical problems. As a result, these students, denied guidance by their natural leaders, followed eagerly a man who offered them definite answers and positive guidance. His name was Hitler and he led his country to ruin.

Specialization and research must remain and grow both in science and in the humanities. But we must also turn out consciously integrated graduates dedicated to a life of justice, reason, mercy, and truth. This is our heritage from the English universities. This integration should be the culminating phase of a man's education. It is the creative answer to subversion of all kinds.

The first step necessary for most students is to bring their scattered and fragmentary "courses" of study together into a focus. The student's own problems provide a suitable focus—war, communism, the welfare state, and labor. With just a little encouragement he can see the need for working out a rational life view to face the world intelligently. The specialists who have taught him the individual courses pay little or no attention to this need.

We have provided good intellectual fare in science and the humanities, taught by competent specialists. Then we have turned our attention to extracurricular activities including athletic and social life, hoping the boy would make his own synthesis. Thus, the final step of the intellectual program has been omitted. We have overlooked the influence of the Oxford tutorial in aiding young men to evolve a rational life view.

This synthesis must be encouraged in small discussion groups, or in individual tutorial hours as has been the practice at Oxford for so many years. Indoctrination, of course, must be despised as abuse of students and ultimately ineffective anyway. A friendly atmosphere must prevail. Opposing viewpoints must be represented clearly. The students must be permitted to choose the topics of discussion, and the world must be looked at through their eyes. Of course, no teacher feels that he is fully competent to meet this demand (neither are the Oxford dons) but we must satisfy this hunger in students for a rational outlook with what we have to give them and not send them away empty simply because we are not "experts" in the field.

After conducting a discussion of this kind once a week with a group of seniors in metallurgical engineering who elected this course last year, I have read their term papers. The papers showed the following features:

1. Each student is consciously constructing his own philosophy which he knows will change as he matures.

2. The philosophies are rudimentary and even shallow in spots, but a vision has been caught of what a rational life view means.

3. Not a single man felt he had been subjected to indoctrination but rather that he had been warned against it. Considerable diversity of views prevailed on any given topic.

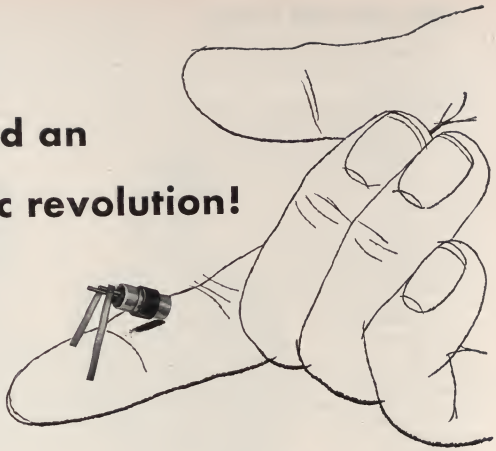
4. Religion enters these philosophies only as a general background and in most of the papers is not mentioned.

5. A sense of social responsibility has been

(Please turn to page 22)

[1] At the time this paper was written the author was professor of Metallurgy at Lehigh University, Bethlehem, Pa.

It sparked an electronic revolution!



The 2A Transistor illustrated is designed to fit a plug-in socket. In one use in the Bell System, ribbon leads are employed as shown above.

Perhaps you've heard something about the transistor—a tiny and mechanically simple electronic device based on an entirely new principle. It can do many things a vacuum tube can do—yet its greatest possibilities may lie in applications where vacuum tubes have *not* been used.

A few years ago this revolutionary device was invented and experimentally made by scientists at Bell Telephone Laboratories. Today, several types of transistors are in production at Western Electric—manufacturing unit of the Bell System.

This didn't just happen! Its manufacture is the result of a lot of teamwork by Western Electric engineers of varied skills and training.

Transistors are unimpressive looking little things, but don't let that fool you! The most delicate metallurgical and manufacturing skills are required in their production. In one type of transistor there are three thin adjacent regions of germanium, each region containing chemical elements in exact quantities, the whole unit being no larger than the head of a match! Suitable leads, or wires, must be positioned in proper relation to these layers with utmost accuracy, using microscopes and oscilloscopes.

Transistors can do many things: transform radio energy for driving a telephone receiver or loudspeaker—amplify weak signals—generate a-c current—convert a-c to d-c—respond to light—increase, decrease or halt the flow of current. Small and rugged, they're going to work today in the Bell System and in varied types of military equipment.

Quantity producing these mighty mites—with laboratory precision—is typical of many forward-looking engineering projects at Western Electric.

Western Electric

A UNIT OF THE BELL SYSTEM SINCE 1882

AIEE and IRE Merge

by Harry Brandler, BEE '55

By majority vote of the respective members, the George Washington University student branches of the American Institute of Electrical Engineers (AIEE) and the Institute of Radio Engineers (IRE) have joined forces to form a Joint Student Branch, consisting of both IRE and AIEE members.

The purpose of this merger was: (1) to increase attendance at the meetings and thus make the meetings more interesting, and (2) to broaden the scope of the young engineer's knowledge. It was decided by the committees of the IRE and AIEE that this would prove more beneficial to both. This system has been tried and proven successful in other universities.

Under this new system, each member of the Joint Branch retains his identity as a Student Member of the AIEE or IRE. Each member shall receive only that publication of the national society of the AIEE or IRE to which he pays dues. Approved expenses of the Joint Student Branch shall be shared equally by the IRE and AIEE up to a limit of $25 each. The dues per semester shall not exceed fifty cents per student.

There are a few differences between the Joint Branch Constitution and the constitutions of the AIEE and IRE, the main one being in the organization of Joint Branch Officers. The Officers of this Joint Student Branch shall be a Chairman, a Vice-Chairman, a Treasurer, and two Secretaries, one of whom is to be an IRE Student Member, and one who is an AIEE Student Member. There shall also be two Student Branch Counselors, representing the AIEE and IRE. These Counsellors should be national members of the respective organizations.

The duties of the officers are essentially the same as before the merger. The Chairman presides at all meetings of the Student Branch, and shall assume all other executive duties not otherwise delegated. The Vice-Chairman shall perform all functions of the Chairman in the latter's absence or at his request, and shall also be responsible for arranging a program (speaker, films, etc.), for each meeting. The Secretary shall keep a record of the meetings, and the Treasurer shall receive all money and pay all bills of the Student Branch, as authorized by the executive committee. There are a few details which will be ironed out at the May meeting, when officers for the following year will also be elected. A more complete report can be given after this meeting.

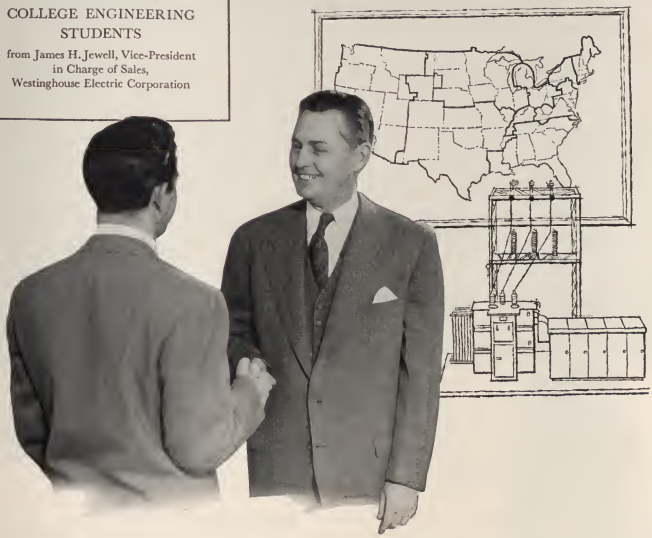
The Joint Student Branch will have four delegates to the Engineers' Council. (Two from the AIEE and two from the IRE.)

It is to be hoped that this merger will increase attendance, make the meeting more interesting, and broaden the view of the field of electrical engineering of all the members. We have every reason to believe that the merger will be of great help towards this goal at this university as it has proven its worth at other institutions.

—W. P. Woolls

A MESSAGE TO COLLEGE ENGINEERING STUDENTS

from James H. Jewell, Vice-President in Charge of Sales, Westinghouse Electric Corporation



To the young engineer with an eye on sales

Let's agree that engineering is not always to be bounded by the quiet of the research laboratory or the roar of production machinery. Some of us like to meet people, to talk with them, to sell them on our ideas. That's why many young college men, like you, are choosing careers in sales engineering.

The sales engineer is a key man at Westinghouse—an important man in our future. Our products are essential to the defense and development of our country, and applying them to the needs of industry and the military requires men who are technically trained.

Westinghouse is a diversified company. Our products cover a wide range, including equipment for generation and utilization of electrical energy, aviation gas turbines, plastics and atomic power. Westinghouse is a growing company. Our expansion program has greatly increased our productive capacity to meet the growing needs of our nation. And here at Westinghouse, you are given every opportunity for personal development. Well-planned orientation and training, and programs for continued education and management development are integral parts of the Westinghouse plan. Yes, if your eye is on a sales career, you'll find the kind of opportunity you want at Westinghouse.

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For information on career opportunities at Westinghouse, consult Placement Officer of your University, or send for our 34-page book . . . *Finding Your Place in Industry.*

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Westinghouse Electric Corporation
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YOU CAN BE SURE...IF IT'S

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NEWS AND VIEWS

G.E. ENGINEERING AWARD GIVEN HERE

Bernard Kilday, Jr., an undergraduate in the department of electrical engineering here, has been recently awarded one of the five $500 awards given annually by the General Electric Company. These awards are presented to students who show exceptional promise in their academic work and are active in extra-curricular activities.

The recipients, selected on a nation-wide basis, are chosen for outstanding ratings in the following categories: intellectual ability, compatibility, ability for oral and written expression, emotional maturity, initiative, appearance, and breadth of general knowledge.

The certificate was given to Mr. Kilday at the Engineers' Banquet May 2 by Professor Norman B. Ames of George Washington University. The $500 is for the purpose of defraying tuition expenses for the following year.

Mr. Kilday's extra-curricular activities, which were also considered for the award, include Theta Tau, Sigma Tau, Phi Eta Sigma, the student branches of the IRE and ASME and recipient of the James MacBride Sterrett, Jr., Physics Award in recognition of scholarship.

ENGINEER SHORTAGE

The 21st annual national meeting of the American Society of Tool Engineers at Detroit March 18 to 20 was the scene for repeated emphasis on the need for more engineers to serve all phases of industrial production. Kenneth Mead, General Motors Education Relations Section Head, told the 105 chapter chairmen assembled for the conference that the United States was 95,000 short of having enough engineers.

Later during the conference it was brought out that there was a need for industry to "scrap the clerical jobs" for engineers, for it was pointed out that many excellent prospects for engineering careers were being wasted on routine clerical jobs.

NEW JOB OPPORTUNITIES

The Engineering Manpower Commission of the Engineers' Joint Council has announced in a recent circular that the 23,000 engineering graduates throughout the country this year and also those to follow in succeeding years will have better opportunities for employment than ever before. The Commission points out that these graduates will be more in demand, have more job security, receive better pay, and will have a larger selection of jobs. The future that awaits them, therefore, is very inviting.

One factor in their favor is that the current need for engineers in industry alone is estimated at 50,000. Long range needs in all phases of the economy demand many more. Most of them have already been sought out by industry, business and government to fill the nation's fast growing technical demands.

The job security offered now is greatly improved, since the nation is becoming more and more dependent on technology, and with the dawn of the atomic age those trained in technical skills will be in great demand.

Another interesting aspect of the engineering employment picture today is that the engineer's income has increased throughout the years so that the graduates of today can step into jobs that pay starting salaries up to $350 and more per month.

It is certainly true today that the future belongs to the engineers.

ASME STUDENT CONFERENCE

The annual ASME Student Conference of Region III was held on April 17 and 18 at Princeton University. The student chapter here was represented by nine members including two of the faculty, Professor Benjamin Cruickshanks and Robert Trumbull and undergraduate John Rice who presented a paper on "The Thermo-Conductivity Meter as a Combustion Analyzer" in the competition. Sixteen Colleges and Universities were represented at the conference which featured the paper competition, a dance and an awards banquet.

PI DELTA EPSILON INITIATES

On Saturday, April 25th, Pi Delta Epsilon, journalism honorary, initiated three members of the MECHELECIV staff. The three so honored were Howard Wilson, Business Manager, Bob Montgomery, Associate Editor and Harold Boyd, Advertising. A banquet followed the initiation ceremonies in honor of the new initiates.

(Please turn to page 28)

Developed by RCA Victor, the new "45 Extended Play" record gives music lovers more music for less money plus a perfect medium for playing shorter classical works and multiple popular selections.

Twice as much music on the same size record

Another RCA achievement in electronics:

A challenging question was asked RCA engineers and scientists in 1951. How can we increase the playing time of a 7-inch "45" record, *without using a larger disc?*

Sixteen months of research gave the answer, "45 EP"—Extended Play. Public response confirmed this as *the most important achievement in the new recording speeds.* More than 2 million RCA Victor "45 EP" records were bought in the first four months of their existence!

Research leadership—your guide to better value: the ability of RCA Victor to solve the problem of more music on a "45 Extended Play" record accents the importance of research *to you.* Whether you plan to buy television, radio or any other electronic instrument, research leadership adds more value to all products and services trademarked RCA or RCA Victor.

CONTINUE YOUR EDUCATION WITH PAY—AT RCA

Graduate Electrical Engineers: RCA Victor—one of the world's foremost manufacturers of radio and electronic products—offers you opportunity to gain valuable, well-rounded training and experience at a good salary with opportunities for advancement. Here are only five of the many projects which offer unusual promise:

- Development and design of radio receivers (including broadcast, short-wave and FM circuits, television, and phonograph combinations).
- Advanced development and design of AM and FM broadcast transmitters, R-F induction heating, mobile communications equipment, relay systems.
- Design of component parts such as coils, loudspeakers, capacitors.
- Development and design of new recording and producing methods.
- Design of receiving, power, cathode ray, gas and photo tubes.

Write today to College Relations Division, RCA Victor, Camden, New Jersey. **Also many opportunities for Mechanical and Chemical Engineers and Physicists.**

Secret of "45 Extended Play" is RCA Victor's discovery of a new way to cut a master disc—with an electrically heated stylus. Grooves are closer. Sound quality is cleaner, clearer, more alive.

RCA® *RADIO CORPORATION OF AMERICA*

World leader in radio—first in television

FLORENCE M. MEARS, Ph.D.

Dr. Mears, an unusual member of the faculty, is a native of Baltimore, Maryland. She attended the Baltimore Public Schools and matriculated to Goucher College in Baltimore (A.B., Math.). She held a fellowship in Mathematics at Cornell, where she received her advanced degrees (M.A., Ph.D., Math.). Her Doctoral Thesis was titled "Riesz Summability for Double Series."

Dr. Mears has been teaching at George Washington University since 1929, and at one time or another all engineering students have taken courses ranging from algebra to differential equations under her guidance. Her field of specialization is Infinite Series.

An article published in *The George Washington Alumni Review*, April, 1949, titled "Professors are People" reads "Florence M. Mears, Ph.D. says that despite the poet's love for the word 'infinite' there is no poetry in 'infinite series.' Actually awful things can happen when you take two series and multiply.

"Colleagues of Miss Mears advise that 'infinite series' is a highly technical field of mathematics, and that Miss Mears is a leading American authority on the subject."

Miss Mears has published numerous articles in important Mathematical Journals, possibly more than any other woman in the world today. Among the many papers she has written are "Nordlund Summability of Cauchy Products" published in *Annals of Mathematics*, October 1945, and "Transformations of Double Sequences," published in the *Journal of Mathematics*, October 1948. Never content to rest on past performance, she can always be counted on for new theorems and the Mathematical journals are always eager to secure her work.

Aside from her prestige in learned circles, Miss Mears is very popular with the faculty and her students and is considered by President Marvin to be 'one of the greatest teachers of mathematics in the country.'

WALDO ROSS GERMAN

Waldo German was born in Exeter, New Hampshire, August 31, 1920. Before he was two years old he moved along with his family, to Duluth, Minnesota. He attended grammar and high school in Duluth and graduated from high school in 1938. From 1938 through 1941, Waldo held various odd jobs including order clerk, veterinarian's assistant, and working in the iron fields.

In the fall of 1941 Waldo moved to Hyattsville, Maryland with his family. After three short terms of employment with Loving Motors, Western Electric Co. and Dictograph Sales Corp., Wally, as he is generally known, enlisted in the U. S. Navy in August, 1942. He served six years as an aviation electrician. His tour of duty took him to Japan, Pelilieu, and the Philippines. Upon his discharge from the Navy in 1948, he worked at Bolling Air Field until February, 1949, when he got the urge for more education and matriculated to George Washington University to study Electrical Engineering. He has attended full time since enrolling, something unusual for engineering students here. During the summer vacation periods he has gained valuable experience in selling, engineering and ditch digging. Waldo says ditch digging is the most honest living he has ever made.

Waldo has been very active in extra-curricula activities here at George Washington. He was treasure of Theta Tau during the school year 1951-52. In 1952 he was elected Chairman of the Student Chapter of the American Institute of Electrical Engineers here at G.W. for the school year 1952-53. In 1951 he was one of the few juniors tapped for membership in Sigma Tau, national engineering honorary. His most recent accomplishment was acting as chairman of the merging committee investigating the merger of the G.W. student chapters of the I.R.E. and A.I.E.E. It was mainly due to his handling that the two organizations were able to merge with no conflict at all.

After his graduation which will take place this month, Wally is going to work for the Vitro Corporation of America as an Electrical Engineer at their Silver Spring, Maryland laboratory. He will probably devote most of his time there to research.

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• Theta Tau is planning on having a party in conjunction with the alumni chapter soon after graduation. This will be a big event that neither undergraduates nor alumni will want to miss. The date has not yet been set but everyone will be notified in advance. The graduating members and the alumni held a meeting Thursday, April 23rd, at the Davis-Hodgkins House for the purpose of electing officers for the coming year for the alumni chapter.

Theta Tau is starting the ball rolling in creating an Engineering Hall of Fame at the Davis-Hodgkins House by donating a picture of Dean Emeritus Fieker. Many smokers and informal get-togethers are being planned for this summer.

• On Wednesday, May 6th, the student chapters of the Institute of Radio Engineers and the American Institute of Electrical Engineers held their first meeting as a joint organization. Westinghouse Electric Corp. generously furnished a motion picture entitled "Energy is Our Business." Following the business meeting which saw the election of officers for the joint organization, refreshments were served. Everyone was pleased by the smooth and efficient way in which the two organizations were merged.

• On Saturday afternoon, April 18, Xi Chapter of Sigma Tau initiated fifteen new student members in studio A of Lisner. Dr. Hugh L. Dryden was initiated as an alumni member.

After the initiation ceremony, as part of the regular meeting, the newly elected officers for the coming year were installed. Herb Rosen, the outgoing president, received a standing ovation from the members of the Chapter for the outstanding job he has done as past president.

The initiation banquet was held that evening at the Continental Hotel. Guest speakers were Dean Mason and William Roeser. Dean Mason gave a brief description of the proposed engineering graduate school at the George Washington University. Entertainment by the initiates and the dance that followed topped off a pleasant evening.

• Mr. Gail A. Hathaway, distinguished hydraulics engineer and expert on large dams, was guest speaker at the April meeting of the A.S.C.E. student chapter.

Mr. Hathaway is a graduate of Oregon State College and worked on irrigation and hydraulics projects in the Western States. He is now Special Assistant to the Chief of Engineers, Department of the Army.

The program consisted of technicolor slides showing large dams throughout Europe and India. He explained that in Sweden and in Norway, plants were constructed underground for economical as well as military reasons. Most of the large dams in Germany that had been damaged during World War II have already been repaired. Mr. Hathaway included pictures of human interest showing various situations that arise in foreign countries, India in particular, where the construction of a large dam is in progress.

On Saturday, April 25, the Twelfth Annual Meeting of the Maryland-District of Columbia Conference of the ASCE Student Chapters was held at Howard University. This was the first time that Howard University was host at such a Conference. The highlights of the day were trips to Rocky Gorge Dam near Laurel, Maryland and to bridges along the new Washington-Baltimore Freeway.

(Please turn to page 28)

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For long-range opportunities, it's hard to beat the jet aircraft field. If *you* want to get into this exciting branch of engineering after you graduate, get in at the head of the parade—at Boeing.

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Boeing engineering activity is concentrated at Seattle in the Pacific Northwest, and Wichita in the Midwest. These communities offer fine fishing, hunting, golf, boating and other recreational facilities. Both are fresh, modern cities with fine residential sections and shopping districts, and schools of higher learning where engineers can study for advanced degrees.

There are openings in ALL branches of engineering (mechanical, civil, electrical, aeronautical, and related fields), for **DESIGN, DEVELOPMENT, PRODUCTION, RESEARCH** *and* **TOOLING.** Also for servomechanism and electronics designers and analysts, and physicists and mathematicians with advanced degrees.

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BOEING

PLASTICS *(Continued from page 9)*

only from the standpoint of total volume, but in the matter of size of individual enterprise.

Reinforced plastics are structural materials of exceptional versatility and great promise. Conceived to perform vital military service during World War II, they have grown impressively during post war peacetime. Today, reinforced plastics are doing an important dual job—in a variety of consumer and industrial products and in many defense materials.

The combination of plastics and reinforcement makes a versatile structural material with many unique characteristics. To plastics' inherent weather resistance, natural moldability, and colorability, the reinforcement adds great strength and toughness. Anyone knowing the basic principles of reinforced concrete can understand how and why plastics are reinforced. As in reinforced concrete, the stress points of the plastic members are strengthened and contraction and expansion is minimized by the addition of reinforcing material. Reinforcement may be in the form of chopped fibers, thin porous mats, or woven fabric. Reinforcing material is usually fibrous glass, but other materials such as wood pulp and flour, paper, cotton, sisal, or asbestos are used.

The making of a reinforced plastic product usually starts by saturation of the reinforcing material with a liquid or viscous resin. The two components are put together in various proportions and may be molded or laminated by a variety of different processes and with various types of dies, presses, and other equipment. Chemical catalysts added to the resins induce hardening or "cure" within a predetermined time cycle.

PLASTICS FUTURES

Every plastics producer is working to improve his product. Present limitations are being continually diminished or illuminated. A polyester resin has recently been developed that will withstand a temperature of 500 degrees Fahrenheit, and there will be continued progress toward the breakdown of the gap between ceramics and plastics. This has already been narrowed by the silocone and fluorine derivatives, with the boron and nitrogen derivatives coming forth. Already the sillocones and fluorocarbons have provided the basic material for a fire-proof mastic and sealing compounds that are very much needed throughout all industry. Some of the new synthetic fibers will be coated with silicone for permanent water repellency. Upholstery and drapery materials thus treated would have added fire resistance. The

(Please turn to page 26)

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GRADUATES *(Continued from page 10)*

accepted as justified. (This alone might justify the course.)

6. The eight students who elected the course are enthusiastic about it. All have elected the sequel for the next semester. Several remarked that this course should be required, not only for all engineering students but for all college students.

7. Several books by broad thinkers have been read by each man from the list: Eddington's "Nature of the Physical World," Sinnott's "Cell and Psyche," Lynd's "Middletown," Lilienthal's "This I Do Believe," Montagu's "On Being Human," Polanyi's "Science, Faith, and Society"; articles such as those on labor in *Fortune Magazine* and others have been read and discussed, thus opening new doors for the student.

8. The material learned in other courses such as science, economics, government, history, politics, international relations, philosophy, and biology have been related to the outlook of an engineer as he enters his profession in society, or at least he has seen in numerous instances that these fragments of knowledge *can* be related in one man's mind and should be related in his own.

9. Specific positions (admittedly temporary) have been taken with respect to the student's problems; the welfare state, private enterprise, communism, war, career ambitions, labor, and personal responsibility.

10. Highly developed technical philosophies have not been stated by the students nor taught; but each man has caught a vision of a rational outlook to which the fragments of life and learning can be related. One student remarks that most people never seem to reach a rational philosophy in an entire lifetime, and he is glad that he has at least made a start.

11. These students have become personally acquainted with the solutions, attitudes, and interests of at least one of their teachers, and one who has taken the trouble to show them clearly the directly opposite view to his own, thus breaking down at one point at least the barrier erected by the mass-production system of education between professor and student, as well as the barrier between youth and maturity.

12. The students feel strongly that the conferences should begin earlier than the senior year.

Next semester there will be guest leaders of the discussions—eminent men in politics, science, labor, and management of industry, thus bridging the gap between campus and community, between books and life as Sir Walter Moberly does at St. Catherine's. We call them "professional-development conferences" because they bring both science and the humanities into a professional focus.

Industrial interviewers who come to hire seniors are already remarking that this group seems to show a maturity of outlook and judgment greater than usually found among seniors.

It cannot be claimed that such conferences infallibly will insure that all students will build a rational life view based on justice and reason, but for our American educational system it at least makes that achievement possible. Our present-day emphasis on specialization makes a step in this direction necessary.

Belief in justice, reason, and truth are the only foundations for these philosophies. Once we of the western democracies suspect that justice and reason are the out-of-date ideologies of a bourgeois age, mere screens for selfish interests hiding behind them and, indeed, sources of confusion and weakness to anyone who would trust in them, democracy is through.

The communists teach that the only real forces in life are economic interest, power, and subconscious desire. Justice is nothing but the will of one section; and there can be nothing higher than the longing for material benefits—so that to talk about higher missions is just foolishness or deceit. As Professor Polanyi points out a generation has grown up full of moral fire and yet despising reason and justice. Hatred and class war thus

(Please turn to page 28)

"We Hit the Jackpot *in* Allis-Chalmers Graduate Training Course!"

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Oregon State College, B.S.,M.E.—1950
and
E. R. PERRY
Texas A. & M., B.S.,E.E.—1950

WHILE taking the course, two engineers developed a revolutionary new circuit breaker mechanism.

"Our experience shows what *can* happen if you work with people open to suggestion. We found men of this kind at Allis-Chalmers, and it has given us a special pleasure in our job.

"We started out like most other graduates with a hazy idea of what we wanted to do. After working in several departments, we requested that part of our training be at the Boston Works of Allis-Chalmers, where circuit breakers are made."

New Design Principle

"Circuit breakers soon became an obsession with us, and we got the idea of designing a hydraulic operator and triggering mechanism for these breakers. Most operators for big breakers are pneumatic.

"Unsuccessful attempts had been made in the past by all circuit breaker manufacturers to build hydraulic operators. The important thing is that no one at Allis-Chalmers said, 'Don't try it—it won't work.' "

Start New Era

"To make a long story short, our study of the problem led us to the hydraulic accumulator and high speed valves being used by the aircraft industry. These had not been available when earlier attempts were made to build a hydraulic operator. With these highly developed devices to work with, we were able to build an operator that combined the best features of pneumatic and hydraulic operation. We call it the *Pneu-draulic* operator. Engineers are saying it starts a new era in circuit breaker actuation.

"This fact is important to us, but it is even more important to know that Allis-Chalmers Graduate Training Course is full of opportunity . . . and as we found out, there's opportunity right from the start."

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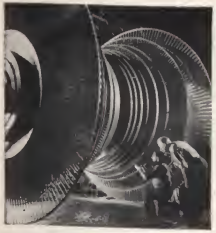

Low-pressure spindle for a 120,000 kw steam turbine generator. Said to be one of the largest ever built in the United States, this spindle is nearing completion in the Allis-Chalmers West Allis shops.

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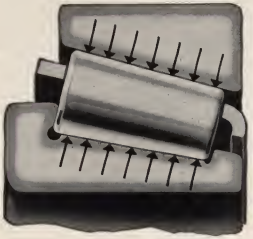

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PLASTICS *(Continued from page 20)*

physical properties of lightness in weight, structural strength and corrosion resistance of some of the reinforced plastics are being put to good use in structural members used in the aircraft and building industries.

With plastics such as these becoming available, there has been much premature speculation on such things as all-plastic houses, automobiles, airplanes, all-weather stadiums, packaged bathrooms, and other possible mass-consumed articles. Speculation on such things was so rife during the war that one disgusted authority in the industry said, "Sure, we're going to make a plastic battleship that will let a torpedo go clear through both sides, then immediately self-seal the holes on each side of the hull and go merrily on its business without delay."

The amazing thing is that eventually many of these speculations may become accomplished facts. Already the Kaiser-Fraser Company has mass-produced sports car bodies out of fiberglass reinforced plastic.

One automobile body manufacturer envisages a day, not too far in the future, where there will be manufactured no more two-door and four-door sedans, as such. He believes that they will be replaced by the so-called "hard-top" convertibles, the tops formed of reinforced plastic. With proper design there will be no necessity for interior trim; molded-in ribs will give ample strength. In addition, the color will be an integral part of the top, so that painting and later finishing will be completely eliminated. Other automotive engineers go even further, predicting the use in tomorrow's automobile of reinforced plastics in springs. Preliminary studies have shown promising possibilities of replacing the multi-leaf semi-elliptical rear spring with a single-leafspring formed of a reinforced plastic lamination.

Engineers see in the future the styling of headlights with the over-all styling of the car, for light control, getting more of the light on the road where it is needed and less on the landscape and in the eye of on-coming drivers. With new and virtually unlimited shapes of headlights, body designers will have a fuller scope for their ideas.

Automotive engineers talk freely aboue the use of thermosets in carburetor bodies, fuel pumps, and similar applications in the car of tomorrow. Corrosion resistance and low absorption are big points here. But attachment of the units presents a present problem. Strength of molded-in-metal inserts must be increased; alternatively is the possibility of developing direct attachments with high-strength plastics.

Electroplated plastics have been seen by one engineer as a replacement for present plated diecast white metal units. Tests contrasting the two indicate that the plated plastics are superior in their resistance to salt spray, water immersion, and humidity, and in fact out-perform the plated metal in every respect.

Nylon has proved itself in a number of small gear and bearing applications and has entered the automotive field in speedometer gears and in equipment for operating radio antenna. Gear designers today think in terms of close tolerances and of rigid metals with a minimum of resilience. Nylon is different. It is tough, but it is resilient. Before the use of nylon, however, could spread to larger gear jobs in future automobiles, the gears themselves would have to be redesigned for the material. Nylon gears cannot be counterparts of metal gears; they can do a big job in motor cars, but only when new ideas are applied.

Many of the applications of plastics in the automotive industry will be put to good use in tomorrow's appliances. Electroplated plas-

(Please turn to page 28)

What's Happening at CRUCIBLE

about hollow tool steel

Crucible is now making its high quality tool steel available in hollow form. Bars of Crucible Hollow Tool Steel can now be obtained with machine finished inside and outside diameters and faces — in three famous grades: KETOS, AIRDI 150 and SANDERSON. Already its use has effected substantial savings for makers of tool steel parts with cutout centers.

typical applications

The ring shaped tools that can be fabricated from hollow tool steel are virtually limitless — beading rolls, bearings and bushings, blanking and briquetting dies, cam dies and followers, chuck jaws, circular knives and shears, cutters, die holders and inserts, engraver and edging rolls, extrusion dies, feed and flue rollers, forming rolls, nozzles, saws, sleeves, slitters, stamping dies, wheels . . . and many others.

how it cuts costs

Crucible Hollow Tool Steel permits a toolmaker to bypass drilling, boring, cutting off and rough facing operations. Naturally, this results in less production time per unit, greater machine capacity, and a reduction in scrap losses. In some cases material costs alone are cut 20% by the use of Crucible Hollow Tool Steel instead of regular bar stock.

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All grades and sizes of Crucible Hollow Tool Steel are carried in stock in Crucible warehouses conveniently located throughout the country.

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2½ O.D. x 1½ I.D.		x	
3 O.D. x 1½ I.D.		x	
3¼ O.D. x 1¼ I.D.	x	x	x
3¼ O.D. x 1½ I.D.		x	
3½ O.D. x 1½ I.D.	x		
3½ O.D. x 2 I.D.	x	x	x
4 O.D. x 1½ I.D.			x
4 O.D. x 2 I.D.		x	x
4¼ O.D. x 1¾ I.D.			x
4½ O.D. x 2 I.D.	x		x
5 O.D. x 2 I.D.	x	x	x
5 O.D. x 2½ I.D.		x	x
5 O.D. x 3 I.D.	x	x	
5½ O.D. x 1¾ I.D.			x
5½ O.D. x 2 I.D.		x	
5½ O.D. x 2½ I.D.	x		x
6 O.D. x 1¾ I.D.			x
6 O.D. x 2 I.D.		x	
6 O.D. x 3 I.D.	x	x	x
6½ O.D. x 3¼ I.D.			x
6½ O.D. x 3½ I.D.		x	
6½ O.D. x 4 I.D.			x
7 O.D. x 2¼ I.D.			x
7 O.D. x 3 I.D.	x	x	
7 O.D. x 3½ I.D.			x
7 O.D. x 4 I.D.	x	x	
7½ O.D. x 3 I.D.	x	x	
7½ O.D. x 3½ I.O.	x	x	
7½ O.D. x 4 I.D.			x
8 O.D. x 3½ I.D.	x	x	
8 O.D. x 5 I.D.	x	x	x
8¼ O.D. x 3½ I.D.			x
8½ O.D. x 5¼ I.D.	x	x	x
9 O.D. x 4 I.D.	x	x	
9 O.D. x 5 I.D.		x	x
9 O.D. x 6 I.D.	x		
10 O.D. x 4 I.D.		x	
10 O.D. x 5 I.D.	x	x	
10 O.D. x 6 I.D.	x	x	x
11 O.D. x 4 I.D.	x	x	
11 O.D. x 6 O.D.	x	x	
11 O.D. x 7 I.D.		x	x
12 O.D. x 5 I.D.	x	x	x
12 O.D. x 6 I.D.	x	x	
12 O.D. x 7 I.D.	x	x	
12 O.D. x 8 I.D.		x	
13 O.D. x 6 I.D.		x	x
13 O.D. x 7 I.D.	x	x	
13 O.D. x 8 I.D.			x
13 O.D. x 9 I.D.		x	
14 O.D. x 7 I.D.	x	x	x
14 O.D. x 10 I.D.		x	
15 O.D. x 9 I.D.		x	x
15 O.D. x 10 I.D.		x	
16 O.D. x 10 I.D.	x	x	x
16 O.D. x 12 I.D.	x	x	

technical service

If you make tools with machined-out centers and wish additional information on Crucible Hollow Tool Steel, or technical assistance in solving an application problem, call in a Crucible representative. Our experienced staff of tool steel specialists is always available.

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GRADUATES *(Continued from page 22)*

become the means of liberating men from the delusions of truth and compassion. The Russian youth disbelieves in public morality in the way we disbelieve in witchcraft. It is not that he has never heard of it, but that he thinks he has valid grounds to assert that such a thing cannot exist. If you tell him the contrary, he will think you peculiarly old-fashioned, or simply dishonest.

For educators the problem is simple: How can young men be aided in building a rational life view based on justice and truth? The professional-development conference is one method that works.

Reprinted from MECHANICAL ENGINEERING, *Nov. 1952.*

SOCIETIES *(Continued from page 18)*

• Mr. George Habach, Executive Engineer of the Harrison Works, Worthington Corporation, spoke on the application, design, operation and maintenance of centrifugal pumps at the May 6th meeting of the Student Branch of the ASME. Mr. Habach delivered an extremely interesting talk which was very enlightening to all. This was the last meeting of the student chapter for the 1952-53 school year. A program for the 1953-54 academic year is now being drawn up and will be announced in the October issue.

NEWS & VIEWS *(Continued from page 14)*

During the business meeting immediately following the initiation an election of officers for the school year 1953-54 was held. Bob Montgomery of the MECHELECIV staff was elected President. This is the first time in many years that an engineer has been president of the honorary journalism fraternity. Mr. Montgomery also holds the position of Editor-in-Chief of this magazine for the coming year.

AWS SELECTS AMES FOR COMMITTEE

Professor Norman B. Ames has recently been selected a member of the Educational Committee of the American Welding Society. The committee is now busy in the formulation of an educational program for the purpose of giving the young engineer a better understanding of welding techniques.

PLASTICS *(Continued from page 26)*

tics will be used in place of metal trim. Nylon self-lubricating bearings will outlast motor shafts while the silicones will replace copper, brass, and aluminum die castings used in small appliance motors.

With the development of larger injection molding machines, the entire inner and outer shell of refrigerators may be molded in one piece. If eventually this can be done it will completely change manufacturing operations and processes for refrigerators.

Another opportunity for plastics in refrigerators is awaiting the development of a flexible, tough, plastic film which is completely impervious to air, gas, and vapors. If we could have a plastic film that air or gas would positively not seep through, we could make an improvement in insulation that would permit a reducing of the wall thickness of refrigerators and home freezers by at least one-half their present thickness. This could be accomplished by simply sealing glass wool batts in plastic bags and replacing the air in the batt with a gas such as Freon, which has a much lower thermal conductivity than air.

ARCHITECTURE

Plastics have many qualities which appeal to architects. They are rust-proof and corrosion-proof. They have integral color or finish which cannot chip or peel, and they need no refinishing. They are easy to clean and they can be made trans-

(Please turn to page 30)

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parent. But plastics have found comparatively few applications to date in building.

A real possibility lies in the replacing of conventional windows with plastics. Rather than a simple substitution of plastics for glass, a one-piece molded plastic window could be designed. The pane would be the flat portion and the frame would be a molded-in rib. The rib-frame could be left transparent or could be spray-painted to make it opaque.

Plumbing fixtures are pretty well standardized and many of them could be injection molded on large machines now installed in many molding plants. Experimental work has already shown that wash basins could be molded from one of the thermoplastics. Bathtubs and shower stalls could be molded of reinforced plastics. Such fixtures would be light in weight, low in cost, easy to install, chip-proof, and with interesting color possibilities. In fact, one industrial engineer has designed a packaged bathroom. The packaged unit will, of course, never be reduced to "take home" size, but it could be successfully "wrapped for sending." The sending would not be to the individul consumer. The bathroom would be packaged for architects and builders, and would be delivered in any of three sizes with four possible use combinations. There are three units, each 32 inches wide by 8 feet long. Unit 1, containing the wash basin and toilet, is the basic utility unit. As such, it could be used alone or in combination with either or both of the other units. Unit 2 contains the bathtub and storage cabinet, the tub designed to receive fittings for a shower, should one be desired. Unit 3 adds to the basic bathroom the convenient features of a separate stall shower and dressing table.

One architect suggests the possibilities of plastic wall panels with integral finish. Such panels could be so designed that the required insulation could be built in, perhaps in the form of a plastic foam material. This panel would combine in one piece what now requires three—the insulation, the structural wall, and the finish. The same panel with the finished face perforated would make an excellent acoustical ceiling.

Shingles, siding, down spouts, guttering, and storm window frames all will be possible if and when the weather-resistance of the material is improved. Additional development will be along the lines of such diversified applications as outdoor display and furniture components.

There is a great variety of ideas for other types of products, running the gamut from disposable raincoats to all-weather stadiums. The disposable rainwear could be made from a vinyl film so thin that enough to cover the average-size woman could be folded into a container no bigger than a cigarette package. The amazing thing about the film is that in spite of its thinness, it is strong enough to resist considerable tearing action. If this film could be made into a raincape by some quick and inexpensive manufacturing process, it is possible that it could be sold from vending machines at a price as low as 25 cents.

One architect has designed an all-weather stadium. The stadium proper would be built of reinforced concrete. If it had two tiers and had an outside diameter of 800 feet it would be big enough to contain a football gridiron or baseball diamond and seat 100,000 spectators. All this is quite conventional. Then plastics enters the picture. A thoroughly practical retractable roof for such a stadium would be made of reinforced plastic. The roof could be made in about 24 segments which meet at a point in the center like the portions of a pie. Each segment would thus be a triangular piece 400 feet long and 100 feet wide at the base of the triangle. These segments, made of translucent sheets of Fiberglass-reinforced polyester, could be hinged to the top of the outside wall of the stadium and counterweighted so that they could easily be raised to a vertical position to open the stadium or lowered almost to a horizontal position to make an all-weather stadium or convention hall. Relatively small and light metal girders would probably be sufficient. To make sure that the roof never has to bear a snow load, low voltage "defrosting" wires could be embedded in the top surface of the plastic, so that snow could be melted as it fell.

SUMMARY

These varied and sometimes crystal-ball predictions are not presented as idle speculation. They are intended to make the reader aware of some of the future materials and uses of plastics about which men in the industry are talking. The amazing thing is that eventually many of these speculations may become reality. Plastics manufacturers themselves find it difficult to separate expansion of present applications from new uses of plastics tomorrow.

After cellulose was put to practical use by Alexander Parkes in 1865, and the industry soon firmly rooted by Baekeland, rapid progress was made in the development of an ever increasing number of plastic materials. However, after World War II an influx of cheap plastics products left an anti-plastics feeling with many consumers. But the materials of today—each one an entity within itself—possess properties which will provide for products not even considered at present.

Every man in industry today, no matter what his field, would do well to keep himself informed and aware of the possibilities of plastics.

PHOTOGRAPHY AT WORK No. 2 in a series:

Knitting mill solves help shortage, attracts and keeps full staff

Hand Knit Hosiery Company of Sheboygan, Wisc., knitters of Wigwam Socks, found many potential employees resisted jobs simply because they didn't know the sort of opportunities offered.

To explain job opportunities, to enlist an efficient staff, here's how this company used photography

Like most businesses today, the knitters of Wigwam Socks found the getting and keeping of good people on jobs a major problem. Especially since some of the work had names strange to highly desirable personnel—such as looping, box drying, etc.

But Hand Knit's industrial relations director knew the potency of photography—used it to show applicants *what* their work would be, what they wear, what their boss looked like. From then on an efficient factory force was more easily lined up—and *kept*. Any business profits when cameras and film get to work.

There are so many new uses for photography being found, that many well-qualified graduates in the physical sciences and in engineering have been led to find positions with the Eastman Kodak Company.

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